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DATE: July 30, 2018

SUBJECT: Report of Foreign Travel to Cancun, Mexico

TO: Dr. Angela Chambers, USDOE Nuclear Criticality Safety Program Manager, National Nuclear Security Administration, NA-511

FROM: Catherine Percher, Nuclear Criticality Safety Division, Lawrence Livermore National Laboratory

MEETING TITLE:

Physics of Reactors (PHYSOR) 2018: Reactor Physics Paving the Way Towards More Efficient Systems

MEETING LOCATION:

Marriott Cancun Resort, Cancun, Mexico

MEETING DATES: April 22-26, 2018

ATTENDEES ON BEHALF OF NCSP:

Catherine Percher

MEETING BENEFIT TO NCSP:

This conference is a biannual meeting cosponsored by the American Nuclear Society's Reactor Physics Division and is the premiere forum to present reactor physics research to the international community. There were dedicated tracks of interest to criticality safety, including Monte Carlo Methods, Fuel Cycle and Nuclear Criticality Safety, and Reactor Physics Experiments and Nuclear Data. C. Percher presented her DOE Nuclear Criticality Safety Program funded research in a paper entitled "Thermal Modeling and Experimental Data Comparison for Plutonium Fueled Critical Experiments." To support the Thermal/Epithermal eXperiments (TEX) design with plutonium, heat transfer calculations were completed to predict the expected temperatures during the experiment. The paper compared the predicted temperatures to the actual experimentally measured temperatures and showed very good agreement for the first two experiments. The presentation also gave an overview of the TEX program, and it generated a lot of interest from the international community at the meeting, as this was the first international forum at which TEX was presented.

MEETING PURPOSE:

PHYSOR is a biannual meeting cosponsored by the American Nuclear Society's Reactor Physics Division and is the premiere forum to present reactor physics research to the international community. There were dedicated tracks of interest to criticality safety, including Track 3: Monte Carlo Methods, Track 4: Fuel Cycle and Nuclear Criticality Safety, and Track 5: Reactor Physics Experiments and Nuclear Data.

The majority of talks attended by C. Percher were from the aforementioned Tracks 3, 4, and 5. A number of talks were of interest due to their relevance to the NCSP work conducted by LLNL. A short overview of a few specific talks are included below.

Delayed Neutron Parameters:

"A Consistent Evaluation of Delayed Neutron Group Constants and Covariances for ^{235}U and ^{238}U Using a Combination of Microscopic and Macroscopic Data" presented by P. Leconte of CEA, France

"Validation of LWR Reactivity Versus Reactor Period. Feedback on the Delayed Neutron Data," presented by A. Santamaria of CEA, France

- These talks highlighted an issue with ENDF/B-VII.1 (American nuclear data library) delayed neutron parameters versus the JEFF 3.3 (European nuclear data library). For VII.1, the delayed neutron parameters were changed from the original Keepin experimentally derived parameters to a fission product model calculation derived parameters, which was shown to change calculated B_{eff} s by up to 20% for some systems, with longer period B_{eff} s showing the worst differences. This could be an issue for critical experiments and benchmarking if B_{eff} is calculated with ENDF/B-VII.1.

New French Critical Experiments Facility:

"Transient Fission Matrix Approach for Assessing Complex Kinetics Behavior in the ZEPHYR ZPR Coupled Core Configurations" presented by P. Blaise of CEA, France

- CEA in France is several years into a design for a new critical facility, to be built at the Cadarache Research Center. The facility is based on a fuel-pin lattice that will have flexible fuel (CEA has many different fuel assemblies from other now-shuttered critical experiment facilities) that they plan to be open to international community. This presentation described their current design ideas for coupled cores, in which a thermal region drives (provides neutrons to) a fast inner region so they can do fast spectrum material and data testing. The aim of the facility is to improve reactor physics knowledge through code/calculation scheme development and for nuclear data improvement. The facility will enable higher spectral emphasis for reproducing various targeted neutron spectra, as well as enhanced transient capabilities for full 3D kinetics code analysis.

The final program for the conference is attached.